

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Re: Application of: Reinhold MEIER, et al.
Serial No.: 10/581,939
Filed: June 7, 2006
For: **METHOD FOR PRODUCING GAS TURBINE
COMPONENTS AND COMPONENT FOR A GAS
TURBINE**
Art Unit: 3726
Examiner: Sarang AFZALI
Docket No. 5038.1028
Customer No: 23280

November 30, 2010

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF UNDER 37 C.F.R. § 41.37

Sir:

Appellant submits this brief for the consideration of the Board of Patent Appeals and Interferences (the "Board") in support of their appeal of the Final Rejection dated April 1, 2010 in this application. The statutory fee of \$540.00 for filing an appeal brief is paid concurrently herewith.

REAL PARTY IN INTEREST

The real party in interest is MTU Aero Engines GmbH, a corporation having a place of business in Muenchen, Germany and the assignee of the entire right, title and interest in the above-identified patent application. The invention was assigned to MTU Aero Engines GmbH by an assignment from inventors Reinhold MEIER and Erich STEINHARDT. The assignment was recorded on June 7, 2006 at reel 018000 frame 0511.

I. RELATED APPEALS AND INTERFERENCES

Appellant, his legal representatives, and assignee are not aware of any appeal, interference or judicial proceeding that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.

II. STATUS OF CLAIMS

Claims 1 to 23 and 38-42 were cancelled. Claim 33 was withdrawn. Claims 24 to 32, and 34- 37 are pending. Claims 24 to 32 and 34 to 37 have been finally rejected as per the Final Office Action dated April 1, 2010.

The rejections to claims 24 to 37 thus are appealed. A copy of pending claims 24 to 37 is attached hereto as Appendix A.

III. STATUS OF AMENDMENTS AFTER FINAL

No amendments to the claims were filed after the final rejection. A Notice of Appeal was filed on September 29, 2010 and received by the U.S.P.T.O. on October 1, 2010.

IV. SUMMARY OF THE CLAIMED SUBJECT MATTER

A method for manufacturing gas turbine components comprises providing at least one metal powder and at least one foaming agent (see, for example step 10, Figure 1, and paragraph [0022]); mixing the at least one metal powder with the at least one foaming agent see, for example step 12, Figure 1, and paragraph [0023]), compacting the resulting mixture to form at least one precursor (see, for example step 13 or 14, Figure 1, and paragraph [0023]); and foaming the at least one precursor by heating the at least one precursor in a mold until a defined degree of foaming is reached (see, for example step 16, Figure 1, and paragraph [0024]); and cooling the at least one precursor when the defined degree of foaming is reached to terminate the foaming (see, for example step 16, Figure 1, and paragraph [0024]), the cooled at least one precursor being at least one gas turbine component having a closed and supporting exterior wall (see, for example wall 22, Figure 2, and paragraph [0028]).

The step of mixing may comprise mixing the at least one metal powder with the at least one foaming agent and with a material selected from the group consisting of ceramic particles, ceramic fibers and combinations thereof (see, for example step 18, Figure 1, and paragraph [0026]).

The at least one metal powder may include a plurality of metal powders, each of the plurality of metal powders having different melting points. (see, for example, paragraphs [0026] and [0032])

The at least one metal powder may include a plurality of metal powders, each of the plurality of metal powders having different powder granularities (see, for example, paragraphs [0026] and [0032]).

At least one supporting and/or function-relevant component made of a non-foamable material may be at least partially surrounded by foam or partially embedded in foam during the foaming step (see, for example, 27, 28, 29, 30, 31 or 46 in Figure 3, and paragraph [0029]).

The at least one gas turbine component may include a blade, and wherein the at least one precursor is foamed in a mold with at least one integrated flow channel, at least one component forming the flow channel being surrounded by foam during the foaming process. (see, for example, 19, 23, 32, 36, 44 in Figures 2-6, and paragraphs [0029] and [0033])

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 24-29 and 36 should have been rejected under 35 U.S.C. 103(a) as being unpatentable over Thore (U.S. Patent 5,511,949) in view of Worz et al (U.S. Patent 5,393,485).

Whether claim 30 should have been rejected under 35 U.S.C. 103(a) as being unpatentable over Thore in view of Worz, in further view of Danforth et al (U.S. Patent 5,900,207).

Whether claims 31, 32, 34 and 37 should have been rejected under 35 U.S.C. 103(a) as being unpatentable over Thore in view of Worz, in further view of Grylis et al (U.S. Patent 6,648,596).

Whether claim 35 should have been rejected under 35 U.S.C. 103(a) as being unpatentable over Thore in view of Worz, in further view of Grylis et al, and further in view of Simon (U.S. Patent 6,827,556).

VII. ARGUMENTS

The Rejection of Claims 24 to 29 and 36 under 35 U.S.C. §103(a) as being unpatentable over U.S. 5,511,949 (Thore) in view of U.S. 5,393,485 (Worz et al.).

Claims 24 to 29 and 36 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. 5,511,949 (Thore) in view of U.S. 5,393,485 (Worz et al.).

Claim 24, the only independent claim, recites:

A method for manufacturing gas turbine components, comprising:
providing at least one metal powder and at least one foaming agent;
mixing the at least one metal powder with the at least one foaming agent,
compacting the resulting mixture to form at least one precursor; and
foaming the at least one precursor by heating the at least one precursor in a mold until a defined degree of foaming is reached;
cooling the at least one precursor when the defined degree of foaming is reached to terminate the foaming, the cooled at least one precursor being at least one gas turbine component having a closed and supporting exterior wall.

The Examiner states, with regard to the primary reference, that “as applied to claims 24-29 and 36, Thore teaches a method of fixedly joining a plurality of hollow gas turbine blades including a closed and supporting exterior wall.” The Examiner admits that Thore fails to disclose or suggest the steps of providing . . . , mixing . . . , compacting . . . , foaming . . . , [and] cooling . . . ” of claim 24, relying on Worz, a patent directed to “a process for the production of metal foam elements” (Worz, col. 1).

Thore is directed to a method of welding hollow blades to the disk of a gas turbine rotor. (Col. 2, lines 45 et seq.). It contains no mention whatsoever of using metal powder or foaming agents to form a gas turbine component.

Worz, as the Examiner apparently concedes, does not disclose, or in any way suggest that its process is to be used for the manufacture of gas turbine components. To the contrary, the only

application mentioned in Worz is for “crush zones of motor vehicles” (col. 3, line 68 to col. 4, line 1).

Neither Thore nor Worz disclose, or in any way suggest that foamed metal powder can be used to form a “gas turbine component having a closed and supporting exterior wall,” as claimed.

Further, Worz is directed to an *extruder* in which metallic powder and foaming agent powder mixture “P” is heated by friction in groove 5, before being extruded through extrusion die 13 as the extrudate shown exiting the extrusion device 1.

Claim 24 recites that the precursor is heated “in a mold” until a defined degree of foaming is reached, and then cooled when the defined degree of foaming is reached. Worz does not disclose this process.

As the examiner recognizes at page 3 of the Office Action, the extrusion process of Worz would, if applied to the claims, correspond to the “compacting” step. The claims recite heating the compacted mixture in a *mold*.

It is therefore respectfully submitted that Thore and Worz are not combinable, and even if combined, would not disclose the method of claim 24. Reversal of the rejection of claims 24 to 32, and 34 to 37 thus is respectfully requested.

Claim 28 Argued Separately

With regard to claim 28, Worz does not teach that “the at least one metal powder includes a plurality of metal powders, each of the plurality of metal powders having different melting points.” Although Worz mentions aluminum, iron, nickel, and copper, it nowhere discloses or suggests combining more than one of them for processing in the extruder of Worz. Reversal of the rejection of claims 28 is thus respectfully requested on this basis as well.

Claim 29 Argued Separately

With regard to claim 29, Worz does not teach “wherein the at least one metal powder includes a plurality of metal powders, each of the plurality of metal powders having different powder granularities.” Worz nowhere discloses or suggest combining plural metal powders, each having “different powder granularities”, for processing in the extruder of Worz. Reversal of the rejection of claim 29 is thus respectfully requested on this basis as well.

The Rejection of Claim 30 rejected under 35 U.S.C. §103(a) as being unpatentable over Thore in view of Worz et al. and further in view of Danforth et al

Claim 30 was rejected under 35 U.S.C. §103(a) as being unpatentable over Thore in view of Worz et al. and further in view of Danforth et al. This rejection is respectfully traversed. Danforth is asserted solely for the additional limitations set forth in dependent claim 30, and thus cannot cure the deficiencies in Thore and Worz set forth above with regard to claim 24. Further, although Danforth does mention that ceramics can be used in its method, Danforth is wholly unrelated to the use of foaming agents and, and Worz exclusively discusses the use metals and metal alloys in connection with its foaming agents. A person of ordinary skill in art at the time of the invention, upon examining Thore, Worz, and Danforth, would have no reason to believe that a combination of metals and ceramics would be usable in the process of Worz. Reversal of the rejection of claims 29 is thus respectfully requested on this basis as well.

The Rejection of Claims 31, 32, 34 and 37 under 35 U.S.C. §103(a) as being unpatentable over Thore and Worz et al. and further in view of Grylls et al.

Claims 31, 32, 34 and 37 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Thore and Worz et al. and further in view of Grylls et al. This rejection is respectfully traversed. Grylls is asserted solely for the additional limitations set forth in dependent claims 31, 32, 34, 37, and thus cannot cure the deficiencies in Thore and Worz set forth above with regard to claim 24. Further, claim 31 recites “wherein at least one supporting and/or function-relevant component made of a non-foamable material is at least partially surrounded by foam or partially embedded in foam *during the foaming step*”, and claim 34 further specifies “wherein the at least one gas turbine component is a blade, and wherein when the at least one precursor is foamed in

the mold, a blade root made of a non-foamable material is partially surrounded by foam or partially embedded in foam *during the foaming step*.” In sharp contrast, in accordance with Grylls, a ceramic foam region is first formed “as a freestanding element” (Figure 6, and discussion at cols. 5-6, col. 8, lines 43-55), and is *subsequently* joined with the metallic non-foam region (Figure 6). Reversal of the rejection of claims 31, 32, 34, and 37 is thus respectfully requested on this basis as well.

The Rejection of Claim 35 under 35 U.S.C. §103(a) as being unpatentable over Thore in view of Worz et al. and Grylls et al. and further in view of Simon

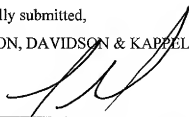
Claim 35 was rejected under 35 U.S.C. §103(a) as being unpatentable over Thore in view of Worz et al. and Grylls et al. and further in view of Simon. As Simon is asserted solely for the additional limitations set forth in dependent claim 35, it cannot cure the deficiencies in Thore, Worz, and Grylls set forth above with regard to claims 24 and 31. Reversal of the rejection of claim 35 is thus respectfully requested.

CONCLUSION

It is respectfully submitted that the application is in condition for allowance. Favorable consideration of this appeal brief is respectfully requested.

Respectfully submitted,
DAVIDSON, DAVIDSON & KAPPEL, LLC

Dated: November 30, 2010

By: 
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APPENDIX A:

PENDING CLAIMS 24 to 32, 34-37
U.S. APPLICATION SERIAL NO. 10/581,939

Listing of Claims:

Claim 24 (previously presented): A method for manufacturing gas turbine components, comprising:

providing at least one metal powder and at least one foaming agent;
mixing the at least one metal powder with the at least one foaming agent,
compacting the resulting mixture to form at least one precursor; and
foaming the at least one precursor by heating the at least one precursor in a mold until a defined degree of foaming is reached;
cooling the at least one precursor when the defined degree of foaming is reached to terminate the foaming, the cooled at least one precursor being at least one gas turbine component having a closed and supporting exterior wall.

Claim 25 (previously presented): The method as recited in Claim 24, wherein the at least one metal powder is selected from the group consisting of an aluminum-based alloy, a titanium-based alloy, a nickel-based alloy, an intermetallic alloy and combination thereof.

Claim 26 (previously presented): The method as recited in Claim 24, wherein the at least one foaming agent comprises titanium hydride.

Claim 27 (previously presented): The method as recited in Claim 24, wherein the compacting step comprises compacting by extrusion or axial pressing.

Claim 28 (previously presented): The method as recited in Claim 24, wherein the at least one metal powder includes a plurality of metal powders, each of the plurality of metal powders having different melting points.

Claim 29 (previously presented): The method as recited in Claim 24, wherein the at least one metal powder includes a plurality of metal powders, each of the plurality of metal powders having different powder granularities.

Claim 30 (previously presented): The method as recited in Claim 24, wherein said mixing comprises mixing the at least one metal powder with the at least one foaming agent and with a material selected from the group consisting of ceramic particles, ceramic fibers and combinations thereof.

Claim 31 (previously presented): The method as recited in Claim 24, wherein at least one supporting and/or function-relevant component made of a non-foamable material is at least partially surrounded by foam or partially embedded in foam during the foaming step.

Claim 32 (previously presented): The method as recited in Claim 31, wherein the at least one precursor to be foamed and the component to be partially surrounded by foam or partially embedded in foam are made of the same material.

Claim 33 (withdrawn): The method as recited in Claim 31, wherein the at least one precursor to be foamed and the component to be partially surrounded by foam or partially embedded in foam are made of different materials.

Claim 34 (previously presented): The method as recited in Claim 31, wherein the at least one gas turbine component is a blade, and wherein when the at least one precursor is foamed in the mold, a blade root made of a non-foamable material is partially surrounded by foam or partially embedded in foam during the foaming step.

Claim 35 (previously presented): The method as recited in Claim 31, wherein the at least one gas turbine component includes a blade, and wherein the at least one precursor is foamed in a mold with at least one integrated flow channel, at least one component forming the flow channel

being surrounded by foam during the foaming process.

Claim 36 (previously presented): The method as recited in Claims 24, wherein the at least one gas turbine component includes a plurality of individual blades or blade segments formed from a corresponding plurality of precursors, and wherein the method further comprises
fixedly joining the plurality of individual blades or blade segments with a forged or cast rotor carrier via soldering or welding.

Claim 37 (previously presented): The method as recited in Claim 24, further comprising, subsequent to the cooling step, coating a surface of the at least one gas turbine component.

APPENDIX B

Evidence Appendix under 37 C.F.R. §41.37 (c) (ix):

No evidence pursuant to 37 C.F.R. §§1.130, 1.131 or 1.132 and relied upon in the appeal has been submitted by appellants or entered by the examiner.

APPENDIX C

Related proceedings appendix under 37 C.F.R. §41.37 (c) (x):

As stated in "2. RELATED APPEALS AND INTERFERENCES" of this appeal brief, appellants, their legal representatives, and assignee are not aware of any appeal or interference that directly affects, will be directly affected by, or will have a bearing on the Board's decision in this appeal.